

CHEETAL

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The Wildlife Preservation Society of India



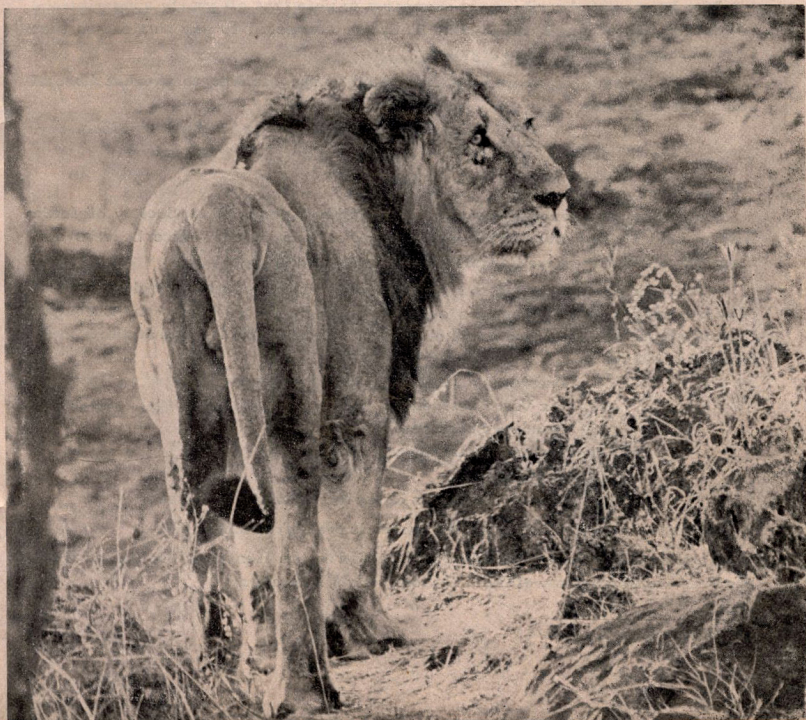
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No. 1

Monarch of Gir

—Photo by Rajesh Bedi



APPEAL

The Wildlife Preservation Society of India is purchasing the present office premises to have a permanent home.

Patrons, Members and Sympathisers are requested to donate generously to enable the society to complete the purchase.

Donations big and small may please be sent to the Wildlife Preservation Society of India, 7, Astley Hall, Dehra Dun, U.P. (India). All donations will be gratefully acknowledged and the names of donors published in Cheetal.

Executive Committee

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Members and Subscribers are requested to note that all yearly subscriptions fall due on 1st of April each year. They are requested to pay in time so that Cheetal may be sent to them regularly.

Change of address should be intimated at the earliest to prevent Cheetal being lost in transit.

Honorary Secretary.

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NOTICE

The Annual General Meeting of Wildlife Preservation Society of India will be held in November 1977, at which elections of the office bearers and members of the Executive Committee will also be held.

Members are requested to suggest names for the following:—(give bio-data of names suggested). The names suggested will be placed before the Executive Committee for drawing up a panel of names. Election will be held at the Annual General Meeting.

1. President
2. Six Vice Presidents
3. Honorary Secretary
4. Two Assistant Secretaries
5. Treasurer
6. Twenty members of the Executive Committee

The last date for receiving the names is 30th of October 1977.

All communications should be addressed to the Honorary Secretary, Wildlife Preservation Society of India, 7, Astley Hall, Dehra Dun.

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Gandhiji and Wildlife

"If our sense of right and wrong had not become blunt, we would recognise that animals had right, no less than men. This education of the heart is the proper function of humanitarian leagues. I know that the lower creation groans under the arrogant lordship of man. He counts no cruelty too repulsive when he wants to satisfy his appetite, whether lawful or unlawful.

If the beasts had intelligent speech at their command, they would state a case against man that would stagger humanity. I can understand the shooting of wild beasts which come to annoy us. But I have found no cogent reasons advanced for wasting money upon organising parties for satisfying man's thirst for blood.

I do believe that all God's creatures have the right to live as much as we have. Instead of prescribing the killing of the so-called injurious fellow-creatures of ours as a duty, if men of knowledge had devoted their gift to discovering ways of dealing with them otherwise than by killing them, we would be living in a world befitting our status as men-animals endowed with reason and the power of choosing between good and evil, right and wrong, violence and non-violence, truth and untruth. I prefer to be called a coward or a fool or worse, to denying, for the sake of being considered a wise man, what I believe to be a fundamental truth of life.

I am not opposed to the progress of science as such. On the contrary, the scientific spirit of the West commands my admiration and if that admiration is qualified, it is because the scientist of the West takes no note of God's lower creation. I abhor vivisection with my whole soul. I detest the unpardonable slaughter of innocent life in the name of science and humanity so-called and all the scientific discoveries stained with innocent blood I count as of no consequence. If the circulation of blood theory could not have been discovered without vivisection, the human kind could well have done without it. And I see the day clearly drawing near when the honest scientist of the West will put limitations upon the present methods of pursuing knowledge.

It is an arrogant assumption to say that human beings are lords and masters of the lower creation. On the contrary, being endowed with greater things in life, they are trustees of the lower animal kingdom".

The last date for receiving the entries is 31st of October 1977

All communications should be sent to the Honorary Secretary, Wildlife Preservation Society of India, 7, Ansley Main, Delhi-110029

Census of Blackbuck in the Velavadar National Park of Gujarat State

By

M.A. RASHID, I.F.S.

Additional Chief Conservator of Forests (Wild Life), Gujarat State

Introduction

The blackbuck (*Antelope cervicapra*) is a truly indigenous antelope and is the sole representative of this genus in India. It is a graceful animal which, with its striking colour and beautiful spiralled horns presents a picture of elegance hardly equalled by any other antelope in the world. Blackbuck are now mostly found in scattered groups in the coastal plains of the Saurashtra region of Gujarat State. However, except in the coastal area known as "BHAL", the number of animals found in different pockets is very small. In the Bhal area of Bhavnagar and Dhandhuka Talukas, large herds of blackbuck still occur. To protect these large herds of blackbuck, from decimation by poachers, a Sanctuary for blackbuck in 890 ha of the Government Vidi area at Velavadar was established in the year 1969 and in the year 1976, the whole of the Velavadar Vidi area admeasuring 1783.88 ha. was constituted into a National Park for blackbuck. This National Park is situated about 70 km north of Bhavnagar off the highway to Ahmedabad. For want of camping facility, this National Park has not been thrown open for general visitors so far. However, a forest lodge costing about 2 lakhs of rupees is now under construction in the National Park and by next year, the general public will be able to visit this unique area for viewing of blackbuck.

When the Velavadar Sanctuary was first constituted, it was roughly estimated to contain about 400 blackbuck. With adequate protection, these continued to multiply at a rapid rate. However, in the first week of June 1976, there was a severe cyclonic storm accompanied by heavy rains which continued for more than five days in the Bhal area and as many as 923 blackbuck died due to prolonged exposure and starvation. It therefore became necessary to know the exact number of blackbuck left in the National Park. It was decided to carry out a systematic and detailed census of blackbuck in the National Park area (including the surrounding villages where some of the animals are known to stray) during the summer of 1977. The 5th of May, 1977, was finally fixed as the date for the census.

M.K. Shri Shivbhadrasinhji, Chairman of the Wildlife Conservation Society of Bhavnagar, very kindly agreed to associate himself with the census as a non-official observer. Nine members of the Society also volunteered to work as enumerators.

Method of Census:

Apart from aerial census, there are a number of methods of censusing blackbuck from the ground. The main amongst them are:—

- (1) Counting animals coming to drink at the watering places.
- (2) By moving about in vehicles and counting the animals with the aid binoculars.
- (3) Dividing the area into convenient blocks and counting animals in each block with the help of enumerators moving on foot.

After thorough discussion, it was decided to carry out the census by the last method, i.e., by visual count by enumerators moving on foot. Further, it was decided to differentiate the animals into adult males and females and young ones. It was also suggested to classify the young ones into two categories viz., (i) young ones with horns and (ii) young ones without horns. However, differentiation of the young ones with horns and without horns was not found practicable without the aid of binoculars and therefore it was decided to drop this classification.

Pre-Census Operations

Blackbuck are known to commonly stray out of the National Park area into the surrounding villages. It was therefore necessary to know upto what distance the blackbuck go out, so that the area for the census could be fixed. This data had to be collected by contacting the villagers in the area surrounding the National Park from 17th to 21st April, 1977. The Forest subordinates stationed in this area were given suitable instructions to collect the information about sighting of blackbuck and submit the same to the Dy. Conservator of Forests, Bhavnagar. In the light of the information so collected, it was decided to include 24 villages surrounding the National Park in the census operations.

In order to determine the number of enumerators required to be posted in each of the above villages, it was necessary to know the number of animals usually found in each location. For this purpose, the forest subordinates were instructed to collect the information regarding number of blackbuck sighted in each village from 22nd to 28th April. On the basis of this information, the villages were grouped and each subordinate was given two to three villages for collection of further data of blackbuck seen in different villages from 29th April to 2nd May. On the basis of this data, it was decided to post sufficient number of enumerators in the villages in which the animals were seen and to post only one enumerator each in the villages where the animals were not seen in order to checkup a NIL report.

It was necessary to select suitable local persons as enumerators for conducting the count. The basic qualifications of the enumerators were fixed as under:—

- (i) Knowledge of the area in which enumeration was to be carried out.
- (ii) Physical fitness to move about over long distances;
- (iii) Ability to count atleast upto 100 digits.
- (iv) Familiarity with blackbuck and ability to recognise the sexes.

The area of the National Park (including its buffer zone) was divided into 30 enumeration blocks. These blocks were demarcated on the ground by fixing bamboo poles with white flags. Outside the National Park Zone, each village was constituted as one block for the purpose of enumeration. As the village boundaries are known to the persons (enumerators), it was not considered necessary to demarcate boundaries of such blocks.

The whole area was divided into the following zones:—

Zone No. 1—National Park zone (including buffer zone) with 30 blocks.

Zone No. 2—Mewasa zone consisting of 11 villages, with 11 blocks.

Zone No. 3—Bavaliyali zone containing 13 villages, with 13 blocks.

Each zone was further divided into convenient sub-zones. The information regarding zones and sub-zones has been given in Statement I.

In conducting the census of blackbuck by visual count by enumerators moving on foot, it is essential that the work of all the enumerators should be properly checked and supervised. The forest staff available in the area being very small, one Range Forest Officer and one Forester who knew this area well were called in from Sasan Gir. The Range Forest Officer, Nalsarovar, was also drafted for this work. Each Zone was placed in charge of a Range Forest Officer and each sub-zone was put in charge of a Forester. The administrative set up of the census has been given in Statement I. (See Pages 6 and 7).

Blackbuck generally do not move about much in the morning hours unless disturbed. Therefore, it was decided to start the census at 8.00 a.m. sharp and to complete the same by 9.00 a.m. For the National Park zone, it was decided to count the animals in each block twice from 8.00 to 8.30 and again from 8.30 to 9.00 hours. The start and end of the counting time was indicated by blowing the siren of the mobile squad jeep moving along the road embankment within sight and hearing distance of the enumerators. It was observed, however, that there was hardly any movement of animals from one enumeration block to another between the two counts if the enumerators moved around gradually on foot without unduly alarming the animals.

All other vehicular traffic in the National Park zone was strictly prohibited during the census period, except on the public road passing along the boundary of the two sub-zones. The sub-zonal officers were assigned the duty of counting the animals in the blocks

Statement No. I

Statement showing the division of habitat of blackbuck into zones and blocks for carrying out census of blackbuck on 5th May 1977.

<i>Zone No. I</i>	<i>Zone No. II</i>	<i>Zone No. III</i>
National Park Zone (Including buffer zone)	Mevasa Zone	Bavali ali Zone
1. <i>Sub-zone No. 1</i>	<i>Sub-zone No. 3</i>	<i>Sub-zone No. 6</i>
Northern portion of National Park Block No. 1 to 15	Mevasa sub-zone	Bavali ali sub-zone
	Block No. 31 to 32	Block No. 42 to 46
2. <i>Sub-zone No. 2</i>	<i>Sub-zone No. 4</i>	<i>Sub-zone No. 7</i>
Southern Portion of National Park Block No. 16 to 30	Rajgad h sub-zone	Kanatalao sub-zone
	Block No. 33 to 35	Block No. 47 to 50
	<i>Sub-zone No. 5</i>	<i>Sub-zone No. 8</i>
	Sanes Sub-zone	Pathi Sub-zone
	Block No. 36 to 41	Block No. 51 to 54

(Contd.)

Administrative Set Up for Census

- | | | | |
|---------------------------|-----|-----------------|---|
| 1. Supervisors— | i) | Official:— | Shri M.A. Rashid, I.F.S.
Additional Chief Conservator of Forests,
Wild Life, Gujarat State, Vadodara. |
| | ii) | Non-Officials:— | Shri M.K. Shivbhadrasinhji
President, Wild Life Preservation Society,
Bhavnagar. |
| 2. Chief Co-ordinator | ... | ... | Shri K.K. Acharya, I.F.S.
Conservator of Forests,
Wild Life Wing, Junagadh. |
| 3. Assistant Co-ordinator | ... | ... | Shri S.P. Chavala
Deputy Conservator of Forests,
Bhavnagar Division, Bhavnagar. |

Zonal Officers

- | | | |
|--|---|---|
| 1. Shri P.P. Raval, Range Forest Officer, Nalsarovar | 2. Shri A.G. Hot., Range Forest Officer, Sihor. | 3. Shri C.V. Pillai, R.F.O., Velavadar. |
|--|---|---|

Sub-Zonal Officers

- | | | |
|--|--|--|
| 1. Shri R.M. Patel, Range Forest Officer, Sasan-Gir. | 3. Shri K.M. Bhatti, Forester, Mevasa. | 6. Shri M.A. Upadhya, Forester, Bawaliali. |
| 2. Shri L.D. Dave, Forester, Velavadar. | 4. Shri P.K. Juneja, Forester, Victoria Park Nursery, Bhavnagar. | 7. Shri A.H.A. Arab, Forester, Patna. |
| | 5. Shri R.H. Bhut, Forester, Sanes. | 8. Shri H.J. Tank, Forester, Mevasa. |

in which there was more concentration of animals, so that any mistake committed by the enumerators could be double checked.

Detailed instructions for conducting the census were issued to the sub-zonal and zonal officers. However, as the accuracy of the census depended upon strict adherence to the instructions issued, it was decided to carry out a rehearsal one day prior to the day of the final census, i.e., on 4th May, 1977, so that any defects in carrying out the actual census could be detected and remedied. M.K. Shri Shivbhadrasinhji and other members of the Wildlife Conservation Society also participated in the rehearsal on 4th May. This rehearsal not only helped the enumerators, sub-zonal and zonal officers to know their areas of operation but also helped them in understanding the census instructions clearly.

The census

There was a heavy thunderstorm on 4th evening which blew off the roof of the watch-tower in the National Park. The ground had also become wet, making it difficult for vehicles to move about freely. However, as the animals were to be counted by moving on foot, there was not likely to be much practical difficulty in carrying out the census.

After discussion on the spot, it was decided to go ahead with the census on 5th morning as scheduled. However, due to rain the previous evening, some difficulty was experienced in the work of checking and getting the reports from the enumerators as some areas could not be approached by vehicles. All the enumerators were posted in their enumeration blocks before 7.00 hours and they were instructed to restrict their movements to the minimum so as not to disturb or alarm the blackbuck. The census operation was conducted in the National Park zone between 8.00 to 8.30 and recounting of the animals was carried out from 8.30 to 9.00 hours. After the census operation was over, it was decided to recheck the counting of animals in the whole National Park Zone by sending out three independent checking parties moving in vehicles and counting the animals with the aid of binoculars. For this purpose, the National Park zone was divided into three sub-zones by prominent features and one checking party was assigned to each sub-zone. The first checking party consisted of the Additional Chief Conservator of Forests (Wild Life), Gujarat State, with two members of the Wildlife Conservation Society of Bhavnagar. The second party consisted of M.K. Shri Shivbhadrasinhji with two members of the Society. The third party consisted of Shri Vishwadeepsinh Rao of Bhavnagar and one other member. The Chief Coordinator and the Asstt. Co-ordinator visited the other two zones and checked the counting by the enumerators in selected blocks.

After the census operation was over, the enumeration forms were filled up for each block by the sub-zonal Officer after knowing from the enumerator concerned the exact

number of animals seen and counted in the categories of adult, male, female and young ones. The sub-zonal officer, after proper checking and verification, submitted a consolidated report of the enumeration of his sub-zone to the Zonal Officer who in turn submitted a consolidated report for his zone to the Chief Co-ordinator. After the receipt of the report of all the Zonal Officers, the same were discussed with the individual sub-zonal officers. The report was also checked for any totalling mistakes in the enumeration forms. After discussion and checking of the Zonal report, a consolidated report was prepared by the Chief Co-ordinator for the whole census area.

On 6th May, the result of the count was discussed in a meeting conducted by the Additional Chief Conservator of Forests, Wild Life, in which M.K. Shri Shivbhadrasinhji and members of the Wildlife Conservation Society, Chief Co-ordinator and Asstt. Co-ordinator also participated. After discussion and checking of the result, the same was signed by the Additional Chief Conservator of Forests, Wild Life, and M.K. Shri Shivbhadrasinhji. An abstract of the census result is reproduced below:—

	No. of blackbuck			
	Male	Female	Young ones	Total
National Park (including buffer zone)— —	338	1052	164	1554
Surrounding villages—	31	72	19	122
	369	1124	183	1676

As suggested by M.K. Shri Shivbhadrasinhji, a census of black-bucks was also carried out separately in Dhankaniya Vidi of Botad Taluka situated about 50 km from Velavadar where blackbuck were reported to occur. The result of this census is as under:—

Male	Female	Young ones	Total
39	104	98	241

However, as this area is a separate entity, these figures are not included in the official census figures for Velavadar National Park.

In addition to the above, small herds of blackbuck are unofficially reported at the following places:—

Bhavnagar District:	Near Victor Port	—40
Amreli District :	Near Rajula	—25 to 30
	Near Damnagar	—15 to 20
	Near Lathi	—15
Junagadh District:	Near Jhanjhmer	—20 to 25
	Near Kotda	—50
Surendranagar District:	Near Limdi	—150
Vadodara District:	Sunderpura	About 150
Total About—		500

Some blackbuck are also known to occur in and around the Rann of Kutch. Thus it is estimated that the present total population of blackbuck in the whole of Gujarat State may be roughly around 2500.

Cost of the Census

The following expenditure was incurred on conducting the census:—

(1) Expenditure on enumerators	(Total 61 enumerators @ Rs. 5/- per day)	Rs. 305/-
(2) Cost of fuel for vehicles used		Rs. 2110/-
(3) Miscellaneous expenditure on poles, flags etc.		<u>Rs. 240/-</u>
Total :—		Rs. 2655/-

Discussion of the Data and Conclusions

The following conclusions can be drawn from the result of the census:—

- (1) There is roughly 1 blackbuck to every hectare of the National Park area.
- (2) More than 92% of the animals are found in the National Park area while less than 8% of animals are found in the surrounding villages in the morning hours.

Generally small herds of blackbuck and solitary males go outside the National Park.

- (3) The sex ratio of male to female is roughly 1:3. Normally it should be 1:6. There is thus a preponderance of males in the area. This clearly indicates the urgent need for culling or translocation of the surplus animals.
- (4) The young ones make up more than 10% of the population which can be considered to be a very satisfactory breeding rate.

- (5) Conducting census by moving about in vehicles and counting the animals with the aid of binoculars has given about 90% accuracy. This method is cheap and can be adopted for preparing rough estimates of animals every year. The elaborate method of dividing the area into enumeration blocks and counting of the animals in each block by enumerators moving on foot may be adopted only at intervals of three to five years.

In conclusion, I would like to express my sincere thanks to M.K. Shri Shivbhadra-sinhji and his band of wildlife enthusiasts for their active participation in the blackbuck census. The local staff also deserve all praise for the systematic and disciplined manner in which they performed the tasks assigned to them. I would like to strongly advocate an all India census of this fast vanishing antelope covering all its known habitats so that its present status can be known more definitely and timely steps taken to preserve all sizeable herds by constituting sanctuaries in suitable locations all over the country.

Statement—II

Names of the Members of the Wildlife Conservation Society—Bhavnagar, who attended the Census of Blackbucks at Velavadar National Park for Blackbuck on the 5th May, 1977.

- | | |
|---------------------------------|----------------------------------|
| 1. Shri M.K. Shivbhadrasinhji | 6. Shri Jitu Bhatt (Enumerator) |
| 2. Dr. Rao | 7. Mrs. H.V. Shukla (Enumerator) |
| 3. Shri Ashwinkumar | 8. Mr. Sathe (Enumerator) |
| 4. Mr. H.J. Shukla (Enumerator) | 9. Mr. Dave (Enumerator) |
| 5. Shri Vishwadeep Sinh Raol | 10. Mr. Vishnav (Enumerator) |

Statement showing the Zonewise count of Blackbuck in different Zones of Blackbuck habitat during the Census conducted on 5th May, 1977.

Sl. No.	Name of the Zone	No. of Black Bucks			
		Males	Females	Young ones	Total
1.	Velavadar National Park Zone (Sub-Zone 1 & 2)	338	1,052	164	1,554
2.	Mevasa Zone (Sub-Zone 3, 4 & 5)	12	22		40
3.	Bavali Zone (Sub-Zone 6, 7 & 8)	19	50	13	82
Total		369	1,124	183	1,676

Statement showing the count of Blackbuck in different Blocks of Blackbuck habitat during the Census conducted on 5th May, 1977.

Sl. No.	Name of the Sub-Zone and Blocks	No. of Animals			Total
		Males	Females	Young ones	
1.	Velavadar Northern Sub-Zone, Blocks 1 to 15	243	702	106	1,051
2.	Velavadar Southern Sub-Zone, Blocks 16 to 30	95	350	58	503
Total		338	1,052	164	1,554
3.	Mevasa Sub-Zone				
	(i) Mevasa	2	3	2	7
	(ii) Ratanpur	—	—	—	—
Total		2	3	2	7
4.	Rajgad Sub-Zone				
	(i) Motidhari	—	—	—	—
	(ii) Rajgad	2	3	1	6
	(iii) Mithapur	—	—	—	—
Total		2	3	1	6
5.	Sanes Sub-Zone				
	(i) Bhadbhid	—	—	—	—
	(ii) Ganeshgad	—	—	—	—
	(iii) Sanes	3	5	1	9
	(iv) Savainagar	1	5	—	6
	(v) Gamli	2	3	—	5
	(vi) Gokulpura	2	3	2	7
Total		8	16	3	27

6. Bavali Sub-Zone

(i) Ratanpur	—	—	—	—
(ii) Hebatpur	1	3	1	5
(iii) Devpura	—	—	—	—
(iv) Bavali	3	2	4	9
(v) Adhelia	4	4	4	12

Total	8	9	9	26
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7. Kanatalao Sub-Zone

(i) Gangawada	6	5	4	15
(ii) Dharampur	5	36	—	41
(iii) Kanatalao	—	—	—	—
(iv) Datretia	—	—	—	—

Total	11	41	4	56
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8. Patna Sub-Zone

(i) Patna	—	—	—	—
(ii) Panvi	—	—	—	—
(iii) Lundhara	—	—	—	—
(iv) Malpara	—	—	—	—

Total	—	—	—	—
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Grand Total	369	1,124	183	1,676
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Distributional Records of Some Coleoptera from Himachal Pradesh (Western Himalaya)

By

ARUN KUMAR * AND D.P. JUNEJA†

Mani, *et al.* (1955) and Singh *et al.* (1955) have chronicled the Coleoptera Fauna of Himachal Pradesh (Sub. Western Himalaya). Subsequently Kapur (1958) and Shukla (1960) also added to our knowledge of known Coleoptera Fauna of this region.

The present study is based on collection of Coleoptera made over last several years by various Survey parties, including the authors, from the High Altitude Zoology Fld. Stn., Zoological Survey of India, Solan (H.P.). It includes 48 species belonging to 8 families. The detailed distributional records of these species are given district wise (within brackets). Species prefixed with asterisk are new records from the area.

I. FAMILY CARABIDAE

1. **Broscus punctatus** Dej.

Present Record : Solan (Solan).

2. **Calosoma maderae** Fabricius

Present Record : Khoksar (Lahaul-Spiti), Kulu (Kulu).

3. **Pheropsophus catoirei** (Dej.)

Present Record : Bamta vill., Changar Khud, Ghumarwin (Bilaspur), Tara Devi (Simla), Pandoh Dam, Sarkaghat (Mandi), Renuka, Dholakuan (Sirmaur), Kulu (Kulu), Gaura (Solan), Jawalamukhi (Kangra).

* 4. **Platynoscelis cordicollis** Kasy

Present Record : Bamta Khud, Kandla-ambi vill., old Bilaspur Town (Bilaspur), Keylong (Lahaul-Spiti).

II. FAMILY DYTISCIDAE

5. **Cybister confusus** Ol.

Present Record : Patta, Kuthar (Solan).

* 6. **Cybister tripunctatus** Ol.

Present Record : Solan (Solan).

*Northern Regional Station, Zoological Survey of India, Dehra Dun (U.P.).

†High Altitude Zoology Fld. Stn., Zoological Survey of India, Solan (H.P.).

* 7. **Hydaticus histrio** (Clark)

Present Record : Dhadera (Bilaspur), Patta (Solon).

* 8. **Sandrocottus dejeani** Aube

Present Record : Patta, Saproon, Solan (Solan)

* 9. **Sandrocottus festivus** Ill.

Present Record : Patta (Solan).

III. FAMILY COCCINELLIDAE

10. **Coccinella septumpunctata** Linnaeus

Present Record : Ranwalla, Samsherpur, Paonta, Naina Tikkar, Nahan (Sirmaur), Saproon, Solan, Ashni Khud (Solan), Kufri, Shogi, Kusumpti (Simla), Old Bilaspur Town, Darlamoor, Bilaspur, Bhakra (Bilaspur), Mandi (Mandi), Pong Dam, Talwara (Kangra).

11. **Coccinella repanda** Thunb.

Present Record : Bamta vill., Kandror vill., Ghumarwin, Old Bilaspur Town (Bilaspur), Kunihar (Solan), Sarkaghat (Mandi, Naina Tikkar (Sirmaur).

* 12. **Epilachna vigitiopunctata** Fabricus

Present Record : Nauni vill., Girsani vill., Bilaspur (Bilaspur), Dehragopipur, Nadaun, Jawalamukhi (Kangra), Kufri, Simla (Simla), Kirtu, Rajgarh, Lal Khud, Dadahu (Sirmaur), Saproon, Solan (Solan).

13. **Brumus suturalis** Fabricius

Present Record : Saproon, Solan, Kaylar vill. (Solan), Pandoh Dam (Mandi), Bamta vill., Nihal vill., Berryghat, old Bilaspur Town (Bilaspur).

IV. FAMILY MELOIDAE

* 14. **Mylabris chichoriil**

Present Record : Mohan Park, Jawahar Park, Solan (Solan), Berryghat, Kandhar vill., Gohal vill., Giragash vill., Ghagas (Bilaspur), Lalkhud, Dadahu (Sirmaur), Ladhu, Durghati (Chamba).

* 15. **Mylabris pustulata** Thunb.

Present Record : Gohal vill., Berryghat, Giragash vill., Kandhar vill., Ghagas (Bilaspur), Dehra Gopipur (Kangra).

V. FAMILY SCARABAEIDAE

16. **Anomala lineatopennis** Blanch.

Present Record : Nohra (Sirmaur), Manali (Kulu).

17. **Anomala rufiventris** Redtenbacker

Present Record : Nohra (Sirmaur), Saproon, Solan (Solan), R.H. Manali (Kulu).

18. **Brahmina cribricollis** Redtenbacker

Present Record : Nohra (Sirmaur).

19. **Catharsius molossus** Linnaeus

Present Record : Banethi (Sirmaur), Deoghat, Solan (Solan), Jeori, Sarhan (Simla), Paonta (Sirmaur), Kulu (Kulu), Joginder Nagar (Mandi).

20. **Catharsius pithecius** Fabricius

Present Record : Banethi (Sirmaur), Dehragopipur (Kangra).

21. **Catharsius sagax** Quens.

Present Record : Dholera (Bilaspur), Paonta (Sirmaur).

22. **Clinteria klugi** Hope

Present Record : Banethi (Sirmaur).

23. **Clinteria spilota** Hope

Present Record : Arki (Solan), Paonta (Sirmaur).

24. **Glycyphana horsfieldi** Hope

Present Record : Banethi (Sirmaur)

25. **Hilyotrogus holosericeus** Redtenbacker

Present Record : Nohra (Sirmaur), Manali (Kulu), Sadhupul (Solan).

26. **Melolontha cuprescens** Blanch.

Present Record : Manali, Kulu (Kulu), Nohra (Sirmaur).

27. **Melolontha indica** Hope

Present Record : Kulu (Kulu), Tara Devi (Simla).

28. **Mimela pectoralis** Blanch.

Present Record : Nohra (Sirmaur).

29. **Onitis falcatus** Wulf.

Present Record : Sarkaghat (Mandi).

30. **Onitis subopacus** Arrow

Present Record : Jawalamukhi, Dehragopipur (Kangra).

31. **Onthophagus bonassus** Fabricius*Present Record* : Naina Devi (Simla), Kandlambi, Bilaspur (Bilaspur).32. **Onthophagus catta** Fabricius*Present Record* : Baghi (Simla), Paonta (Sirmaur), Dharlamoor, Dholera (Bilaspur).33. **Xylotrupes gideon** Linnaeus*Present Record* : Manali, Kulu (Kulu), Saproon, Solan (Solan), Tara Devi, Kathi (Simla).34. **Synopsis bucephalus** Fabricius*Present Record* : Banethi (Sirmaur).

VI. FAMILY LUCANIDAE

35. **Lucanus cantori** Hope*Present Record* : Kulu (Kulu).36. **Lucanus lunifer** Hope*Present Record* : Saproon, Solan (Solan)

VII. FAMILY CERAMBYCIDAE

37. **Aeolesthes holosericea** Fabricius*Present Record* : Dholakuan (Sirmaur).38. **Autocrates senescens** Westw.*Present Record* : Saproon, Solan (Solan).39. **Dorysthenes (Lophosternus) hugelii** Redtenbacher*Present Record* : Saproon, Deonghat, Kunihar (Solan), Nohra (Sirmaur).40. **Stromatium barbatum** (Fabricius)*Present Record* : Koti (Solan).

VIII. FAMILY CHRYSOMELLIDAE

41. **Aetheodactyla plagiata** Duv.*Present Record* : Swarghat (Bilaspur).42. **Aulacophora faveicollis** Kust.*Present Record* : Berryghat (Bilaspur), Beas Bridge Dehra Gopipur (Kangra), Rahighat, Theog (Simla).43. **Galerucida bicolor** Hope*Present Record* : Kunihar (Solan).

44. **Haltica cyanea** Weber

Present Record : Bashisht Khud, Manali (Kulu), Sarahan (Sirmaur), Berryghat, Bilaspur (Bilaspur).

45. **Merista quadrifasciata** Hope

Present Record : Samli, Pandoh Dam, Swarghat (Mandi).

46. **Paridea octomaculata** (Baly)

Present Record : Dugshai (Solan).

47. **Plagioderma versicolor** (Laich.)

Present Record : Ghumarwin (Bilaspur).

48. **Varania cardoni** Ws.

Present Record : Ramsheel, Kulu (Kulu), Samli vill., Pandoh (Mandi), Deonghat (Solan).

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A Statistical Approach to Animal Population Analysis

By

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Abstract

The paper deals with the study of the technique of population analysis of animals from the statistician's point of view. Such a study is designed to meet the objectives like calculation of vital statistics for the animals and also to form a quantitative assessment of the changes occurring in the animal kingdom over a specified period of time etc.

More evolved and scientific studies of animal population are likely to enrich the knowledge of our culture which enshrines forms of animal kingdom.

1. Evolution in the concept of statistical analysis on animal population

The idea of population analysis in game management is relatively new, and the ideas are not as fully evolved as in demography, the study of human populations. Statisticians, mathematicians and sociologists have largely contributed to the major tenets of population dynamics, but the applications in the field of animal populations are yet to make any significant impact.

To trace the history of development it is recalled that the Florentine Statesman Machiavelli published his thoughts on population analysis in 1525 and a number of other sociologists published several other papers on aspects of population analysis during the period between 1590 and 1767.

In 1677, Hale described a theory similar to the historical theory later propounded and elaborated by Thomas Malthus in 1798. The Malthusian Theory as it is known recognised that the population growth followed orderly arithmetic principles. A French mathematician named Verhulst developed an equation in 1838 that describes dynamics of population. Such mathematical equations supplied a more concrete form of growth in population dynamics and practically laid the foundation of present-day population analysis. But it is yet to be found that the development of methodology in demography has been made full use of in the field of game biology so far as the adaptations of these methods are concerned.

The determination of vital statistics has practically become "sine qua non" in the study of animal population. The vital statistics tend to describe the status and role of a population for the moment of time during which such data is collected and are indicative

of the dynamic role of population, such as mortality rate, survival rate and mean expectation of life etc. etc. Space does not bear any direct positive correlation in the study of population analysis which is primarily a function of time. "Census as opposed to "population analysis" is primarily a function of "space".

Leopold (1938) used the principles of human dynamics in the field of game biology. But the methods employed did not actually follow the actuarial ones. Kel Kar (1944-1947) and Petrides have used Kill records to explain game biology. Some mathematical equations were also employed for deriving vital statistics like "longevity" and "turnover" and also to determine the age structure. Such contributions are regarded as foundations in animal population analysis, though the conventional "life table" methods could not be employed by them. The difficulty of employing actuarial life table methods in animal population analysis is due to the fact that it is very difficult to draw a statistically unbiased sample in animal populations, Biometry tends to reveal the following desiderata for animal population:—

- (1) Population structure with the composition in sex and age.
- (2) Mean expectation of life for animal.
- (3) Survival percentage or its complement, the mortality percentage.
- (4) Longevity of an animal.
- (5) Ability for a population to maintain itself.
- (6) Impact of hunting pressure or predation upon the population productivity, age and sex structure.
- (7) Determination of predator-prey ratio and the impact of environmental variants upon the population productivity, age and sex structure.

The following sources of raw data can be tapped for determination of vital statistics:—

- (1) Kill records from which species, sex and age data are obtained by examining dead animals.
- (2) Live specimens obtained in live-trapping, marking, and retrapping operations.
- (3) Reproductive rates determined both from dead and live animals.
- (4) Sex and age ratios obtained from field observations of living animals.

In order to gauge the changes in the animal population, population growth structure needs to be ascertained statistically. It was observed that the essential growth form and structure do not depart radically from one animal to another or in other words it was postulated that the growth form, by and large, follows the Malthusian Theory of population

growth in which the increase in numbers follows a geometric progression. The quantitative assessment of several biological characteristics like average number of young per breeding cycle, sex ratio at birth, breeding age (age at which the species contributes recruitment to the population), longevity and also the differential mortality differentiated into species, age and sex.

2. Methods of Construction of Life Table

The construction of life table for animal population is a task fraught with great difficulties. The difficulty is principally statistical because of the fact that unbiased raw data of the distribution of death statistics versus age class can hardly be collected from the existing available records.

The following table head may be constructed for the construction of life table for any species:

Table No. 1

Year: (1)	Breeding Population (2)	Reproductive rate (3)	Recruitment (females) (4)	Total female population (5)
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Then the data can be graphically plotted to form what is known as "Age-structure Tables".

An assumption of cohort say of 1000 animals that theoretically begin life together need be made and the following hypothetic mortality record is to be made in the following table:—

Table No. 2

Age class (x) (1)	Number dead in age class x (d'x) (2)	Number of deaths per thousand (dx) (3)	Number of survivors per thousand (lx) (4)
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The data should represent the distribution of death frequencies in a population.

The following vital statistics can be calculated as follows:

$$(1) \text{ Mortality rate } qx = \frac{dx}{lx} \times 100$$

Survival rate can be derived from the mortality rate as they are complimentary.

(2) Mean expectation of life (designated by the symbol ex) : This vital statistic serves the following purposes : (1) Prediction of the average length of life of a population cohort.

(2) Prediction of the average length of a life for those individuals that have attained specific age classes.

(3) Method of Computation

It is required to find out :

$$Lx = \frac{lx + lx + 1}{2}$$
 Where lx represents the average number of animals living between two age classes.

The formula for mean expectation of life is given as follows:—

$$ex (1) = \frac{Lx (1) + Lx (2) + + Lx (n)}{Lx (1)}$$

Where subscripts (1), (2), etc. refer to values in given age-classes.

4. Distribution and Abundance of Animals

According to Elton "In solving ecological problems we are concerned with what animals do in their capacity as whole, living animals, not as dead animals or as series of parts of animals. We have next to study the circumstances under which they do these things, and, most important of all, the limiting factors which prevent them from doing certain other things. By solving these questions: It is possible to discover the reasons for the distribution and numbers of animals in nature".

Four major categories can be recognised which influence an animal's chance to survive and multiply (1) weather (2) food (3) other animals—and pathogens (4) A place to live.

Density of a Population

Ecologists commonly speak of the density of a population when they wish to refer to the number of animals in a particular area. There are two ways of measuring density of a population.

(1) Absolute density: When it is possible to count or estimate all the animals in the area it is proper to speak of the result as the absolute density of the population.

(2) Relative density: When it is sufficient to know the proportions of the number of different animals in the area.

Measurement

Relative Density: The chief methods of measuring relative density depend on the collection of samples that represent a constant but unknown portion of total population. The same may be collected by a conventional trap, such as a fly-trap or a mouse-trap or a suction trap by any other device.

Absolute Density:

Counting the whole population:

It is the most direct way of counting all animals living in an area.

Conclusion

The animal population analysis and the construction of life table for any animal species require the specific knowledge of characters like the size of a population at a particular point of a time, recruitment rate, mortality rate—age specific and sex specific, reproductive rate etc. Measurement of such characters is difficult in natural wild populations and may be pursued in captive conditions.

One feels encouraged to think that zoological gardens have already lent a good hand in such gigantic tasks of game biology and research, but we are still to go a long way in this field so that any significant impact is made in the pursuit of biological research. It may be worthwhile to point out that such efforts do not brook any delay.

Behaviour Ecology of Wildlife

(through consequential evidences)

By

SAROJ RAJ CHOUDHURY

Summary

The current crisis in fossile fuel has focused universal attention to the sustained importance of environmentally renewable resources. Plants and animals yield vital environmental resources. They reproduce and grow. Hence, unlike the exhaustible mineral resources, they could be inexhaustibly renewed by 'Conservation through wise use' (Roosevelt). Turnover rate in animals is higher than in trees; a fawn becomes adult in two years, a chick in just one year.

The present day key-words, protection and preservation are preventives. They do not reverse the process towards constructive direction. Historically, in developed nations, science has been the tool applied for the reconstruction. Spectacular re-establishment of a number of seriously endangered species, one for example the saiga antelope of the Russian steppes, is the result.

We are guided more by emotion and subjective projection. Historical evidences reveal the reason in the ignorance and managerial vacuum during post-independence period. Conflict of the rural man with the depradating wild animals to the benefits of the pre-independence privileged classes, was reflected in the mass-scale destruction of wildlife in the aforestated vacuum in early post-independence days. Science did not size up the future danger. Even today it does not. It has, therefore, been easy for the pseudo-scientists to define the direction of presumptive and wishful preservation. The result is: perpetuation of costly trials and errors, much of the basics of which have already been done and documented by the developed countries.

Scientific conservation warrants systematic measurements of properties and functions, and their interactions within the community and with their physical environment. Identification of the most appropriate seral stage to yield the maximum integrated bilateral benefit on a particular land is the first obligatory objective. Behaviour of biota provides the main clue.

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Indian Institute of Science, Bangalore.

A beginning has to be made. The methodologies to be applied should be broad-based, widespread and fast.

Wildlife science is multidisciplinary. However, the core of initiation, irrespective of disciplines involved, is basically the application of a strong commonsense of an intelligent individual with eyes and ears open in the practical field. The level of efficiency in the application lies in the faculty of observation, merit of experience and rational interpretation. The rural man, ecologically associated with wildlife, sizeably acquires these by sheer environmental empirism. Often many of them become remarkably proficient in reading animal signs in the field and accurately visualising the related behavioural implications. With rigorous training and practice anyone can acquire such proficiency. The forests and other natural habitats of wildlife in this country demand such efficient field technicians; for, they conceal far more of animals than what they reveal. Behaviours have to be rationally inferred here from the reliable identification and interpretation of evidence in the field. Methodical spooring, interpretation and documentation reveal through time significant behavioural aspects of many of the structural components of the biota and their integrated influence on the total behaviour of the ecosystem.

Available manpower—paid employees and voluntary participants—have to be oriented in these field wildlife techniques and guided to take spatiotemporal measurements of events and evidences. It is most urgent. But we are losing sight of this vital aspect of start in scientific lines because of the growing anxiety complex with increasing list of actually and many presumably, threatened species. Without dependable data, we continue to grope in the dark and often lose track to the detriment of conservation.

Science should find the way. To illustrate my point, a number of examples drawn from the field have been cited, fragments of interrelated behavioural features sensibly interpreted from evidences in the field. Numerous from fragments methodically collected through time by a large number of trained participants, when arranged against respective units of space and successive points of time, will reveal whole gamut of behavioural sequences and interactions, describe important structural and functional aspects and define major problems of conservation.

Definition of problems with backdrop of confident structural and functional data is the main clue to constructive conservation; its necessary corollary is the avoidance of mistakes. It can only be done when we have some dependable basis to visualise the actual 'living mechanism' in any biotic community.

The future of wildlife conservation and its stability can only be ensured by an environmentally educated and conscious future generation.

O. Need for 'conservation through wise use' of renewable natural resources

The sustained importance of environmentally renewable resources is being increasingly realised. The crisis of exhaustible fossil fuel is a clear pointer. The future stability of human beings lies in 'conservation through wise use' of the inexhaustibly renewable environmental resources which might last for ever if they were harvested scientifically and not faster than they reproduced. Renewability of resource is a function of reproduction and growth. These are biotic properties. Plants and animals reproduce and grow. Many of these yield important resources.

0.1. Plants: "The wood, bark, roots and foliages of trees provide materials for more than 5000 different products, including cellulose, paper, spirits, furniture, laquer, rayon, plastics, tiles and so on" (4). In rural India—more than 80% of our population lives in villages—trees form the backbone of environmental harmony and socio-economy; health, home, hearth, food and fence, all included. They do more: in stretches as forests, they support stable agriculture and maintain a clean and relaxing atmosphere. Measurements reveal that in temperate zone, "On a warm sunny day one hectare of forest builds up 120-150 kilograms of new organic substance absorbing 220-280 kilograms of carbon dioxide from the air and turning out 180-220 kilograms of oxygen. The forest can absorb almost all the carbon dioxide contained in a layer of air 45 metres thick In one year a single hectre of forest can filter out 50-70 tons of dust from air"(4). In tropical climate these functions are far more dynamic and productive throughout the year. Bulk of our country has tropical climate.

0.2. Animals grow on these year-through productive plants by direct herbivory and/or through secondary routes of carnivory. Like trees, many of them produce important consumable and non-consumable resources for the sustenance and comfort of human beings. Of these, protein and leather are the two most important. The turnover potential in any animal far exceeds that of trees. Petrids and Swank (1965) calculated the productivity of African elephants at 0.34 kcal/m²/year from a standing crop of 7.1 kcal/m²; respective values for beef cattle were 0.86 and 7.5, and for white tail deer 0.64 and 1.3 (Davis and Golley, 1963). The data on saiga antelope (*Saiga tatarica*) of Russian steppes (Bannikov, 1961, and Bannikov *et al.* 1961) analysed by Frederic H Wagner (5) reveal a yearly increment of 0.20 kcal/m² from a standing crop of 0.26 kcal/m², i.e. nearly 80 per cent.....A seedling has to grow through many years to become a mature tree. A fawn becomes an adults in two years, a chick in just one year. The turnover potential in deer and antelopes in our country could easily be 30-40% under normal conditions and 40-50% under intensive conservation management.



Shri Chand Shekhar, President of the Janata Party, looking on as Shri P.K. Deka, M.P., President, Delhi Branch of the Wildlife Preservation Society of India, plants a tree in New Delhi.

A typical panther kill opened at the chest-abdomen.





Evidence of Browsing.

In many of the resource-yielding birds the average annual increment could be 100-200 per cent.... A developing nation with the growing realities of the needs of its exploding population can ill-afford to ignore the promise of productive wildlife under 'Conservation through wise use' (Roosevelt). In truth, sadly, we have ignored it.

1. **Preservation is only restrictive not constructive**

With increasing zest we are adding emphasis on preservation of wildlife. Survival of many species is considered at stake because of conflicting human influence. Stringent laws have been enacted. Adverse human influences, both real and more, imaginary, are being expensively attempted to be removed. Particular areas are being identified for complete protection. These are preventives which may delay the disappearance of the susceptible, even in the sanctuaries and the National Parks. They will not, however, reverse the process towards constructive and productive directions through models that could ultimately be expanded over larger areas of these natural resources. Back in the early thirties Aldo Leopold, the father of wildlife science in the States, said, "Both scientists and sportsmen now see that effective conservation requires in addition to public sentiment and laws, a deliberate and purposeful manipulation of the environment". We are today where North America was some half a century back. And yet, we hesitate to profit by their experience. In 1920, the total population of saiga in Central Asian region of USSR was less than 1000, evidently then with more precarious future than our present day tiger. There has been phenomenal re-establishment of saiga through conservation management(6). By 1970 the total population of saiga was 1.5 million yielding an annual harvest of 5,00,000. Science was the tool used with farsighted pragmatic outlook with the backdrop of the needs of the land and its people. Sustained and increasing benefits from this animal is the result. Such tools of management are yet to be applied in this country. We are guided more by emotions than by facts, more by subjective projections than by objective assessments. History reveals the result.

2. Prior to independence the interest in wildlife was mainly on game animals. Hunting was principally the prerogative of the privileged. Exploitation was by and large far less than the increment. The resultant overabundance in many wild animals installed perpetual conflict with the rural people. The rural man considered wild animals as environmental hazard. The early post-independence vacuum gave the lease for systematic clean-up of this hazard in many wildlife areas in this country. Visibly fast depletion generated competition for the appropriation of the sporadic residual. Legal regulations and socio-ecologic outlook were seriously

deficient; the latter still remains so. Scientific conservation of wildlife had never been heard of even by the foresters who held, and still hold sway over bulk of the wildlife habitat in the country, forests covering more than two-fifths of the total land area. Drastic decrease in the wild denizens created the anxiety-complex that many of our beautiful animal species may not be available to our future generations.

3. **'Conservation through wise use' can be applied at any stage of depletion**

In the absence of scientific wildlifing, it has been opportune for the painter, the poet and the pretender to becloud the rationale on 'Conservation through wise use' which could be knowledgeably instilled at any stage of depletion. We still continue the costly trials and errors, much of the basics of which have already been done and documented by many of the developed countries. Protection and preservation are the present day key-words, hopefully to ensure the perpetuity of the endangered. Adequate protection and necessary preservation are natural consequences of educated conservation. Mere preservation is passive guestimates and wishful promises. Scientific conservation is active calculations and confident predictions. The way to the former is easy because it is based on colourful imagery of stories and yarns. The path of the latter lies in strainuous hardwork of factual measurement, objective analysis, sensible interpretation and rational inferences. Conservation of wildlife covers the entire biotic complex and its abiotic components—the lands, the plants and the animals—in short the total ecological system.

3.1. **Systematic measurements its ruling steps**

The ruling steps are systematic measurements of the properties and functions of the biotic communities, and the interactions among themselves and with their physical environment. The qualities and level of interdependence and tolerance or resistance to invasion determine the spatiotemporal equilibrium of a particular community.

3.2. **Identification of the most appropriate seral stages is the first diagnosis**

Temporal changes in equilibrium may lead to significant structural changes and thus manifest ecological succession. Conservation tries to identify the most appropriate successional stage on a particular land with highest bilateral benefits—larger species structure and maximum interspersion. Direct conservation tries to reach and arrest that stage in perpetuity by discrete manipulation. In this, the behaviour of the biota constitutes the main key. For, a biotic community at any particular point of time is nothing but an issue of the behavioural interactions of its related structural components.

3.3. Preliminary beginning is still awaited: Wildlife science in this country has not even made a preliminary beginning. Discordant, fragmentary attempts have certainly been made, often *ab initio* without background and priorities, and frequently with heavily biased preconcepts. Behaviour of single animal, particularly when strategically frozen on celluloid, has been expanded over the whole country to strike an abstract for all variable abstracts in time and space. Behavioural manifestations of conditioned animals have been projected to the independent living free in the wild. Diagnosis have often been wrong and treatments thus not responsive because objectives are nebulous and methods often unmethodical. The convincing example of one such is the case of the refugee Sundar, the adolescent tiger of Sunderbans in August, 1974. Methodical installation of wildlife science is indeed urgently necessary.

4. **Wildlife science is an integrating discipline, a strong commonsense its core of support**

Wildlife science tries to integrate with mathematical precision forestry, agriculture, horticulture, biology, chemistry, physics, earth science, ethology, psychology and sociology. These need not scare us at the moment, for the core of initiation in wildlife science is a strong commonsense of an intelligent individual with eyes and ears open in the practical field. What we need urgently now are broad based methodologies to apply wildlife oriented commonsense even of the forest guard and the rural co-operator to objectively assess the present status and behavioural trends of wildlife in their different habitats in the country. It is possible. I have seen and heard of numerous undocumented examples of it during more than four decades of my field wildlifing in various habitats in the country. For example, while working on gaur (*Bos gaurus*) and elephants (*Elephas maximus*) it took me quite a few days to reason out why the gaurs, although freely mixing with village cattle and cowherd were keeping away from the salt-licks and wallows watched by us. Late Makunda of Chhotkei village in Angul forests of Orissa diagnosed the cause immediately when he heard me; "They are being repelled by the foreign smell of your boot-marks." In those few words he conveyed what a verbose scientific thesis could have revealed, the stimulus-response interrelationship with the presentation of a novel stimulus: Wooden footwears locally made effectively solved the problem. ... In another case, the spoors of the Asugarh man-eater with her 32nd human kill baffled me for over two hours on rocky ground before Langda of Malchua took it up and traced the lead over steep slope to the last remains of the dead body more than 300 metres away in the bushy crevice of a saddle. In those 300 metres, he visualised everything that could be interpreted from the spoors, the most important being that the tigress was lame in her left front paw (the handicap which turned her man-

eater) and that she being still inefficient was not in good health which necessitated frequent resting and lapping of water once, halfway up, from a nearly pool.

5. **Dense forests in the tropics conceal much more than they reveal: inert evidences provide reliable parameters**

We are fast losing the field technique knowhow in the rural man living with wild-life, and this is most unfortunate. For unlike the open savannas of East Africa or snowy expanse in temperate region, the forests and natural habitats in this country may visually reveal only a bare fraction of what animals they conceal. Animals may not be readily visible, but their inert evidences left in the field, their sounds related to some behavioural functions and specific vocalisation of some species would rarely escape notice of the educated observer. Inert evidences in the field—excreta, hoofmarks, footprints, feeding etc.—respond to appropriately designed samplings. When systematically sampled at successive points of time, they reveal significant behavioural features of the concerned species. When compared with trend measurements in structural components of the biotic communities, they give enough indications of behavioural interactions. Faithful spatiotemporal records of events actually observed in the field provides support for confident interpretation. Systematic documentation of these interpretations through time progressively defines the structural and functional aspects with clearer focus. And, these are the first obligatory steps in any attempt for scientific conservation of wildlife.

6. **Field evidences can be distinctively distinguished and carried in the mind**

Tak for instance the tiger. It is rarely seen. It is soft footed, and hence leaves individually distinctive pugmarks. To the sophisticated theoreticians, equal sized pugmarks of different animals may appear to be of one tiger. To the efficient tracker in the field, like Makunda and Langda, individuals would not only be distinct but to a large extent sexually dimorphic.

6.1. **Reading "Signs":** Lord Baden Powell dealing with the subject, Reading "Signs" in his invaluable book *Scouting for Boys*, has narrated the case of the "Lost" camel quoted below(1).

"Egyptian trackers are particularly good at spooring camels. To anyone not accustomed to them, the foot marks of one camel look very like those of any other camel. But, to a trained eye they are all as different as people's faces, and the trackers remember them very much as you would remember the faces of people you had seen."

"Some years ago a camel was stolen near Cairo. The police tracker was sent for and shown its spoor. He followed it for a long way until it got into some streets, where it was entirely lost among other footmarks.

"A year later the same police tracker suddenly came on the fresh track of this camel—he had remembered its appearance all that time. It had evidently been driven with another camel whose tracks he also recognised. He knew they were made by a camel which belonged to a well known camel thief. So, without trying to follow the tracks through the city, the tracker went with a policeman straight to the man's stable, and there found the long-missing camel." About South American trackers he stated in the said book, The 'Gauches', or Cowboys of South America are fine scouts. One of these men was once sent to track a horse but failed to find it. Ten months later, in a different part of the country, he suddenly noticed the fresh spoor of this horse on the ground. He at once followed it up and recovered the horse."

- 6.2. **Aid to practice:** Such fabulous faculty of carrying the distinctive look of pugmarks in the mind can be acquired by rigorous practice. The Tiger-tracer invented by me provides very good aid.
- 6.3. **Methodical spooring and interpretation** Systematic spooring of tigers by field technicians trained thus, combined with evidences from faecal matter, dens, bedding, clawing, predation, vocalisation and actual sightings reveal through time significant behavioural aspects in tiger ecology. Valuable corollary inferences are also derived on the related synecology. This is much cheaper, more widely applicable and can be continued through years as against the expensive short duration biotelemetric harnessing of a few tigers as recommended by some of the so-called wildlife experts.
- 6.4. The method can be applied on other important wildlife species: Remote sensing of behaviour through their consequential evidences left in the field is possible in the case of most of the ground animals and many of the arboreal types, particularly the mammals.
7. **Available manpower should be oriented to take measurements**
We have in this country considerable manpower engaged in systematic forestry and unsystematic, largely presumptive wildlifing. The technical personnel down to the forest guards need speedy training in broad-based field wildlife techniques particularly in spatiotemporal recording of events and evidences. Voluntary participation by others will be very useful. Methodologies should be

simple and techniques habituated through practice. We should honestly be in great hurry. For the urgency at the mement lies not in creation of departments and posts of the officially designated expertise and experts, without scientific background; the grater urgency lies in the speedy orientation and harnessing of available manpower, both paid and voluntary, to initiate, as stated earlier, methodical application of scientific conservation.

8. **Farsight being blurred by increasing anxiety**

We are losing sight of this vital aspect of start on scientific lines because of the growing anxiety-complex, which is being worked up with an increasing list of threatened species.

8.1. King of pheasants, the peacock (*Pavo cristatus*) continues under presumptive protection. It could be behaviourally integrated and managed in forest, wasteland and many agricultural fields as a highly productive multiple resource, and also considerably enhance the environmental beauty.

8.2. To me it appears that there is no reason to suspect that behaviourally seclusive python (*Python molurus*) as endangered. In my experience, the frequency of sighting or capture of pythons has shown increase rather than decrease. Evidences of pythons, particularly the lick of its trail and the smell from the burrows and tunnels under occupation, are very frequently detected by one knowledgeably looking for them.

8.3. Both the species of *Varanus*, the land monitor and the water monitor are stated to be endangered. Evidences of the former are seen everywhere; the latter in its natural habitat, particularly the mangroves, is the most frequently seen or heard, rustling through the detritus. These behaviourally alert lizards functionally pose greatest hazard to the eggs and young of many of the ground and arboreal animals. Without the basis of any reliable field evidences, the protection appears to be demographically uncertain and ecologically unsound. There are many such instances which not only increase our anxiety but more regressive, they diffuse the focus on the fewer actually deserving, the great Indian bustard (*Choriotis mgrieeps*) and the gharial (*Gavialis gangeticus*) for example.

9. **Science should find the way**

We continue to grope in the dark. For there is very little scientific light to show us the way, often least with person designated by virtue of appointment, not intrinsic merit. And thus, we lose track too often, by wrong behavioural interpretations.



Evidence of Grazing.



Rejections after the elephants uprooted, cleaned and ate the grass rhizomes.



- 9.1. I have seen a good tiger area discredited at the first call because no tiger turned up to the bait during the visit of a designated expert. It got the full credit as one of the best tiger areas during a subsequent visit when four tigers turned up for the bait at the same stake.
- 9.2. A man in saffron, comes face to face with a tusker suddenly at the bend of a forest foot path. The tusker in his fright pushes the man with his trunk and by accident, while walking away—back foot would be placed on the front foot impression—he places his right front and back feet successively on the fallen man. Later the man dies. The evidences are clear, long after his death. And yet the tusker is reported by the park officer as the worst rogue in the vicinity. A rogue would have trampled to finish with his front foot alone.
- 9.3. A forest camp in dense elephant habitat is, negligently, deep asleep in total darkness; even the smouldering camp fire has died. An appetitive young calf with its mother elephant, enters the camp, tinkers with the front seat cushions of two loaded trucks and then goes to investigate into the single leaf hut little away from the main camp. Three men sleeping in that hut are awake with a start and shouting irrelevant, they rush helter-skelter to the main camp. The scared shelter-seeking calf and its mother run with equal speed away to the cover on the opposite. The evidences in the trucks and the hut cause great concern about elephant attacks on forest camps, confirmed by the pseudo-expert but condoned by the common-sense of the rural man who sensibly blames the careless campers.
- 9.4. In another part of the country a local man walks on a wide motorable forest road in broad daylight. A makhna (tuskless male elephant) of known 'agonistic' response, chases and gets him. He then deliberately pulls the man apart tearing and peeling him into bits and shreds. The expert verdict on him, to the disgust of the local man, is, "benefit of doubt"! ... Such are the instances of misinterpretation of behavioural evidences that prove the precarious subtle pretence of amateur protagonists for environmental conservation. Their expensive application usually veers the future at considerable slant, often on the retrograde, with the wishfully propagated promises.
10. In a dynamic tiger land of perennial streams and rolling expanse of woodland over nearly 3000 sq kms, the tiger census figure is hasistant 17. Systematic enquiry reveals the existence of tigers on the periphery along the surrounding populated plains. In the interior of these hills, scattered random transects reveal high success-ratio in detecting tiger evidences all over. Elephant herds seek protection for the young babies near forest camps, with the tiger close at heel. A big male tiger occasionally visits one such camp at night and in day time too... In another forest camp a man is cleaning utensils at the bend of a stream near

a cutting. A tiger on the move, apparently adapted to human influence, jumps across the stream from the top of the higher bank. He lands close to the man, turns, looks into his eyes and then unconcernedly walks off... Tiger dens are found under frequent occupation inside logging coupes, quite a few not far from the logging camps. Educated documentation of these evidences plus systematic sampling through time would reveal far more number of tigers than the censused 17 over 3000 sq. kms. When you think of the prey animals for these tigers with equally or more dense population of panthers, roadside evidences here appear to be paradoxical. But take off on foot away from the road which is associated with 'defensive response' to the danger of poaching. If you know the average number of defecation per 'animal day' of the prey animals and the rate of obliteration of the faecal matter, you will realise from the incidences of different types of faecal matter alone that the paradox on the roadside is explained by the evidences away from the road. The course of refinement is thereafter far more confident than the aimless groping in the dark.

11. Mosaics of reliable fragments reveal confident outlines

The foregoing are only a few sporadic instances drawn from my experience. None of these involved any kind of super technical field knowledge or ethological parlance, fragments of interrelated behavioural features sensibly interpreted from evidences in the field. Imagine the importance of numerous such fragments methodically collected through time by a large number of trained participants. When arranged against the respective units of space and successive points of time, they will reveal the whole gamut of behavioural sequences and interactions, describe important structural and functional aspects and define the major problems of conservation management.

12. Clearly defined problems are the main clues to constructive conservation: avoidance of mistakes its necessary corollary

Definition of problems with the backdrop of confident structural and functional data is the main clue to constructive conservation; its necessary corollary is the avoidance of mistakes. It can only be done when we have some dependable basis to visualise the actual 'living mechanism' in any biotic community. Else, in the rush to strengthen protection and ensure preservation we may continue to perpetuate many of the "Mistakes in Conservation" as enumerated in my publication in CHEETAL, the journal of The Wild Life Preservation Society of India, Vols: 15/4, 16/1, 16/2 and 16/3.

Postscript (on October, 1974)

In the Central region of Mayurbhanj District in North Orissa lies the rolling elevated plateau of perennial streams, the Similipal forests, nearly 3000 sq.kms. It has been identified by the 'Project Tiger' as one of the tiger reserves. Its newly recruited field staff, most of them untrained even in forestry, are under training, since last three months, in field wildlife techniques.

The sequence of training is as follows:

- i) Intensive practice to activate awareness, precision and reflexes of each trainee to sensitise his sensory receptors towards wildlife and regulate his somatic functions in disciplined measured. The steps are: regular physical training, rigorous field work, accuracy in aim, estimation of time in rhythmic seconds, and regulation of locomotion over measured zebra-strips (150 steps=100 metres).
- ii) Use of simple equipments to: locate position in the field and find directions; take structural and physiognomic measurements of habitat with the Grass-tracer (Choudhury, 1972); take climatological records and practice with Tiger-tracer (Choudhury, 1970).
- iii) Round the clock measurements of behaviours of wild animals in captivity to get enough practice for accurate recordings in the field. Incidental data of this study throws light on major aspects of feeding, preference gradients in cafeteria, quantities of food consumed, time taken for passage of food through the digestive system, number of defecations per 'animal day', cycle of rests and activities etc.
- iv) Estimate of rate of obliteration of pellet-groups, dung-boluses, excreta etc. in different seasons.
- v) Identification and aging of animal evidences.
- vi) Rope work: knotting, lashing, splicing etc.
- vii) Use of tools and weapons.
- viii) Use of simplified hand-sorting punch-cards for field records and documentation.
- ix) The training is appropriately punctuated with simple theoretical backing.

Nota bene

None of aforesaid training items are beyond the time and scope of even the school and college students during off times, holidays and when camping out. Most of these could easily be included in academic curricula. The future of wildlife conservation and its stability can only be ensured by an environmentally educated and conscious future generation.

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Fauna of Corbett National Park

(Continued from Cheetal, Vol. XVIII, No. 3 & 4, Page 47)

2. Birds

By

B.S. LAMBA AND R.K. BHATNAGAR

Order : Podicipediformes

Family : Podicipitidae : Grebes.

1. *Podiceps cristatus cristatus* (Linnaeus) : Great Crested Grebe.
2. *Podiceps ruficollis capensis* Salvadori : Little Grebe or Dabchick.

Order : Pelecaniformes

Family : Pelecanidae : Pelicans.

4. *Pelecanus onocrotalus* Linnaeus : White or Rosy Pelican.
3. *Pelecanus philippensis philippensis* Gmelin : Spotted billed or Grey Pelican.

Family : Phalacrocoracidae : Cormorants and Darters.

5. *Phalacrocorax carbo sinensis* (Shaw) Large Cormorant.
6. *Phalacrocorax fuscicollis* Stephens : Indian Shag.
7. *Phalacrocorax niger* (Viellot) : Little Cormorant.
8. *Anhinga rufa melanogaster* Pennant : Darter or Snake Bird.

Order : Ciconiiformes

Family : Ardeidae : Herons, Egrets, Bitterns.

9. *Ardea cinerea rectirostris* Gould : Eastern Grey Heron.
10. *Ardea purpurea manilensis* Meyen : Eastern Purple Heron.
11. *Ardeola grayii grayii* (Sykes) : Indian Pond Heron or Paddy Bird.
12. *Bubulcus ibis coromandus* (Boddaert) : Cattle Egret.
13. *Egretta alba modesta* (J.E. Gray) : Eastern Large Egret.
14. *Egretta intermedia intermedia* (Wagler) : Smaller or Median Egret.
15. *Egretta garzetta garzetta* (Linnaeus) : Little Egret.
16. *Nycticorax nycticorax nycticorax* (Linnaeus) : Night Heron.
17. *Ixobrychus minutus minutus* (Linnaeus) : Little Bittern.
18. *Ixobrychus cinnamomeus* (Gmelin) : Chestnut Bittern.
19. *Ixobrychus sinensis* (Gmelin) : Yellow Bittern.

Family : Ciconiidae : Storks.

20. *Ibis leucocephalus* (Pennant) : Painted Stork.

21. *Anastomus oscitans* (Boddaert) : Openbill Stork.
22. *Ciconia episcopus episcopus* (Boddaert) : White necked Stork.
23. *Ciconia ciconia ciconia* (Linnaeus) : White Stork.
24. *Ciconia nigra* (Linnaeus) : Black Stork.
25. *Xenorhynchus asiaticus asiaticus* (Latham) : Black necked Stork.
26. *Leptoptilos dubius* (Gmelin) : Adjutant Stork.
27. *Leptoptilos javanicus* (Horsfield) : Haircrested Adjutant.

Family : Threskiornithidae : Ibises, Flamingos.

28. *Threskiornis melanocephala* (Latham) : White Ibis.
29. *Pseudibis papillosa papillosa* (Temminck) : Indian Black Ibis.
30. *Plegadis falcinellus falcinellus* (Linnaeus) : Glossy Ibis.
31. *Phoenicopterus roseus* (Pallas) : Flamingo.
32. *Phoeniconaias minor* (Geoffroy) : Lesser Flamingo.

Order : Anseriformes.

Family : Anatidae : Ducks, Geese.

33. *Anser albifrons albifrons* (Scopoli) : Whitefronted Goose.
34. *Anser erythropus* (Linnaeus) : Lesser Whitefronted or Dwarf Goose.
35. *Anser anser rubrirostris* Swinhoe : Eastern Greylag Goose.
36. *Anser indicus* (Latham) : Barheaded Goose.
37. *Dendrocygna javanica* (Horsfield) : Lesser Whistling Teal or Tree Duck.
38. *Dendrocygna bicolor* (Vieillot) : Large Whistling Teal.
39. *Tadorna ferruginea* (Pallas) : Ruddy Shelduck or Brahminy Duck.
40. *Tadorna tadorna* (Linnaeus) : Common Shelduck.
41. *Anas angustirostris* Menetries : Marbled Teal.
42. *Anas acuta* Linnaeus : Pintail.
43. *Anas crecca crecca* Linnaeus : Common Teal.
44. *Anas poecilorhyncha poecilorhyncha* J.R. Foster : Spotbill Duck.
45. *Anas platyrhynchos* Linnaeus : Mallard.
46. *Anas strepera strepera* Linnaeus : Gadwall.
47. *Anas penelope* Linnaeus : Wigeon.
48. *Anas querquedula* Linnaeus : Garganey or Bluewinged Teal.
49. *Anas clypeata* Linnaeus : Shoveller.
50. *Netta rufina* (Pallas) : Redcrested Pochard.
51. *Aythya ferina* (Linnaeus) : Common Pochard.
52. *Aythya nyroca* (Guldenstadt) : White-Eyed Pochard.
53. *Aythya fuligula* (Linnaeus) : Tufted Duck.
54. *Nettapus coromandelianus* (Gmelin) : Cotton Teal.

Order : Falconiformes.

Family : Accipitridae : Hawks, Vultures etc.

55. *Elanus caeruleus vociferus* (Latham) : Blackwinged Kite.
56. *Pernis ptilorhynchus ruficollis* Lesson : Grested Honey Buzzard.
57. *Milvus migrans govinda* Sykes : Parkiah Kite.
58. *Milvus (migrans) lineatus* (Gray) : Large Indian Kite.
59. *Haliastur indus indus* (Boddaert) : Brahminy Kite.
60. *Accipiter gentilis schvedowi* (Menzbier) : Eastern Goshawk.
61. *Accipiter badius dussumieri* (Temminck) : Indian Shikra.
62. *Accipiter trivirgatus indicus* (Hodgson) : North Indian Crested-Goshawk.
63. *Accipiter nisus nisosimilis* (Tickell) : Asiatic Sparrow-Hawk.
64. *Accipiter nisus melaschistos* Hume : Indian Sparrow-Hawk
65. *Accipiter virgatus kashmiriensis* Whistler & Kinnear : West Himalayan Besra Sparrow-Hawk.
66. *Buteo rufinus rufinus* (Cretzschmar) : Longlegged Buzzard.
67. *Butastur teesa* (Franklin) : White-Eyed Buzzard-Eagle.
68. *Spizaetus nipalensis nipalensis* (Hodgson) : Feathertoed Hawk-Eagle.
69. *Spizaetus (cirrhatus) linnaeus* (Horsfield) : Changeable Hawk-Eagle.
70. *Hieraetus fasciatus fasciatus* (Vieillot) : Slender Hawk-Eagle.
71. *Hieraetus pennatus* (Gmelin) : Booted Hawk Eagle.
72. *Aquila heliaca heliaca* Savigny : Imperial Eagle.
73. *Aquila nipalensis nipalensis* (Hodgson) : Eastern Steppe Eagle.
74. *Aquila clanga Pallas* : Greater Spotted Eagle.
75. *Aquila pomarina hastata* (Lesson) : Lesser Spotted Eagle.
76. *Ictinaetus malayensis perniger* (Hodgson) : Black Eagle.
77. *Haliaeetus leucorhynchus* (Pallas) : Ringtailed or Pallas's Fishing Eagle.
78. *Ichthyophaga nana plumbea* (Jerdon) : Himalayan Greyheaded Fishing Eagle.
79. *Torgos calvus* (Scopoli) : Black or King Vulture.
80. *Gyps fulvus fulvescens* Hume : Indian Griffon Vulture.
81. *Gyps himalayensis* Hume : Himalayan Griffon Vulture.
82. *Gyps indicus tenuirostris* G.R. Gray : Himalayan Longbilled Vulture.
83. *Gyps bengalensis* (Gmelin) : Indian Whitebacked Vulture.
84. *Neophron percnopterus ginginianus* (Latham) : Indian Scavenger Vulture.
85. *Gypaetus barbatus aureus* (Hablizl) : Himalayan Bearded Vulture or Lammergeier.
86. *Circus cyaneus cyaneus* (Linnaeus) : Hen Harrier.
87. *Circus macrourus* (S.G. Gmelin) : Pale Harrier.
88. *Circus pygargus* (Linnaeus) : Montagu's Harrier.
89. *Circus aeruginosus aeruginosus* (Linnaeus) : Marsh Harrier.

90. *Circaetus gallicus gallicus* (Gmelin) : Short-toed Eagle.
 91. *Spilornis cheela cheela* (Latham) : Crested Serpant Eagle.
 92. *Pandion haliaetus haliaetus* (Linnaeus) : Osprey.
 Family : Falconidae : Falcons
 93. *Microhierax caerulescens caerulescens* (Linnaeus) : Himalayan Redbreasted Falconet.
 94. *Falco biarmicus jugger* J.E. Gray : Laggar Falcon.
 95. *Falco peregrinus japonensis* Gmelin : Eastern Peregrine Falcon.
 96. *Falco peregrinus babylonicus* P.L. Sclater : Redcapped or Barbary Falcon.
 97. *Falco subbuteo subbuteo* Linnaeus : Hobby.
 98. *Falco subbuteo centralasiae* (Buturlin) : Central Asian Hobby.
 99. *Falco severus rufipedoides* Hodgson : Indian Hobby.
 100. *Falco chicquera chicquera* Daudin : Redheaded Merlin.
 101. *Falco tinnunculus tinnunculus* Linnaeus : European Kestrel.
 102. *Falco tinnunculus objurgatus* (Baker) : Indian Kestrel.

Order : Galliformes

Family : Phasianidae : Pheasants, Partridges, Quails.

103. *Francolinus francolinus asiae* Bonaparte : Indian Black Partridge.
 104. *Francolinus pondicerianus interpositus* Hartert : North Indian Grey Partridge.
 105. *Coturnix coturnix coturnix* (Linnaeus) : Grey Quail.
 106. *Coturnix coromandelica* (Gmelin) : Blackbreasted or Rail Quail.
 107. *Perdica asiatica punjaubi* Whistler : Punjab Jungle Bush Quail.
 108. *Arborophila torqueola torqueola* (Valenciennes) : Common Hill Partridge.
 109. *Galloperdix spadicea spadicea* (Gmelin) : Red Spurfowl.
 110. *Tragopan satyra* (Linnaeus) : Crimson Horned Pheasant.
 111. *Lophura leucomelana* (Latham) : Whitecrested Kaleej Pheasant.
 112. *Gallus gallus murghi* Robinson & Kloss : Indian Red Jungle fowl.
 113. *Pucrasia macrolopha macrolopha* (Lesson) : Koklas Pheasant.
 114. *Pavo cristatus* Linnaeus : Indian Peafowl.

Order : Gruiformes

Family : Turnicidae : Bustard—Quails.

115. *Turnix sylvatica dussumier* (Temminck) : Little Bustard Quail.
 116. *Turnix tanki tanki* Blyth : Indian Yellowlegged Button Quail.
 117. *Turnix suscitator taigoor* (Sykes) : Indian Bustard Quail.
 Family : Gruidae : Cranes.
 118. *Grus grus hlfordi* Sharpe : Eastern Common Crane.

(To be continued)

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Termite Hunting

By

MR. AND MRS. WHITAKER

Just before the breaking of the monsoon last year we took up Rajamani on his promise to take us termite hunting in the scrub jungle around Madras.

We set out one evening toward a termite mound he claimed was "ripe"; that is, the termites were waiting for the first rains before emerging from their mud prison. Rajamani pointed to several other mounds on the way, telling us the species (each species constructs a distinctive mound) and a bit about their natural history.

Reaching the right one, he and his wife tied an old sari along the bushes in order to arrest the strong southerly breeze. Next, a tin box was inserted in a hole which Rajamani dug a metre from the termite hill. Over the opening of the tin he placed two twigs, making a kind of bridge over the gap; and on this a lighted oil lamp.

Rajamani then roasted a brown seed ("eechēl kote" in Tamil), rather smaller than a mango seed, over the lamp, sniffing it from time to time. It was then crushed on a stone and powdered—and the smell was pronounced to be perfect (resembling that of the earth after the first rains).

Before launching once more on this ancient Irula method of hunting termites, Rajamani said his pre-hunt prayer, and began to circle the hill. A sudden whirring sound broke the silence of the night; Rajamani walked round and round the mound, imitating the swarming of termites by vibrating his lips. Now and then he would sing snatches of hunting songs: "The dove is out And the rains come down, Come out, come out, come out!" At the same time he sprinkled the powdered seed over the termite mound.

Some minutes passed and he finally stopped to peer into the minute holes in the hill and sat down near it. Later he signalled us and we went up single file to peer past his pointing finger; some little activity was discernible in the holes. What we could see, Rajamani explained, were the "sel", or workers, who were not fully convinced and they were holding the mature, winged termites back.

Suddenly the ground was a mass of little aeroplanes, all taxing towards the light in a hurried scramble. Hundreds and thousands of termites poured out of the holes. The thin bridge did them in, and they fell into the trap (the tin box). Soon this was full and had to be emptied into a gunny sack. By the end of the hunt Rajamani and his wife had two sackfuls of active, buzzing protein. These would be swung up and down to separate the wings, and the termites would be roasted and spiced, to make a delicious snack.

Rajamani couldn't wait however and ate the termites live, popping them rapidly into his mouth so that the wings remained on one side, to be spat out when time permitted. This protein jolt was pleasant "high" he said, and termites tasted nutty. We thought to try and nonchalantly ate a few; but the stinging bites on our tongues brought an end to this adventure. Eating live termites is an art, like catching a cobra by the tail.

While the party was in full swing a black scorpion came along and presenting his back to us, started to eat. Termites scurrying along were waylaid and grabbed with startling agility. Later two frogs (*Rana brevipes*) joined us and they too sat down to meat. When we got up to go, they were painfully waddling away, almost failing over, turning their bloated bodies away from the much dwindled stream of termites.

Courtesy—'Hamadryad'

Madras Snake Park

WILDLIFE CONSERVATION PLEDGE

"Convinced of the fundamental importance of conserving the natural environment, upon which rests the foundation of human civilisation, I solemnly pledge that I will spare no effort to preserve our vanishing Wildlife and our dwindling forest areas which our generation holds in trust for posterity.

दुदवा राष्ट्रीय उद्यान

लखीमपुर खीरी, उत्तर प्रदेश

लेखक : आर० एल० सिंह, निदेशक, दुदवा राष्ट्रीय उद्यान

किसी जनपद में नेशनल पार्क की स्थापना राष्ट्रीय ही नहीं अन्तराष्ट्रीय महत्व का विषय होता है। क्योंकि विश्व में लगभग दो हजार नेशनल पार्क ही हैं और हमारे देश में मात्र दस। इस प्रकार भारतवर्ष के ग्यारहवें नेशनल पार्क को जन्म देने का गौरव लखीमपुर खीरी को मिला है।

प्रश्न उठता है नेशनल पार्क की स्थापना हेतु ऐसी कौन सी अनिवार्य शर्तें हैं जो उपमहाद्वीप आकार वाले भारतवर्ष जैसे राष्ट्र में भी इनकी संख्या इतनी सीमित है।

उत्तर है—किसी क्षेत्र को 'नेशनल पार्क' घोषित करने के लिये अनिवार्य है कि उस क्षेत्र के प्राकृतिक सौन्दर्य और उसमें पलने वाले पशु-पक्षियों एवं पेड़ पौधों को राष्ट्रीय स्तर पर महत्वपूर्ण ठहराया जा सकता हो। क्योंकि किसी नये 'नेशनल पार्क' की स्थापना होते ही देश-विदेश के पर्यटक एवं प्रकृति प्रेमी यह अपेक्षा करने लगते हैं कि उस क्षेत्र में कुछ ऐसा अनोखापन होगा जो उस राष्ट्र में अद्वितीय होगा। इसलिए किसी नये क्षेत्र को 'नेशनल पार्क' घोषित करने से पूर्व राज्य एवं केन्द्र सरकार यह सुनिश्चित करना अनिवार्य समझती है कि वह क्षेत्र राष्ट्रीय प्रतिष्ठा के अनुरूप है या नहीं।

आइये देखें कि लखीमपुर खीरी में एक फरवरी १९७७ को स्थापित हुए भारतवर्ष के सबसे कम आयु वाले नेशनल पार्क दुदवा में यह 'कुछ' क्या है जिसके कारण इसे राष्ट्रीय स्तर पर अद्वितीय पाया गया। बहुत संक्षेप में दुदवा नेशनल पार्क का अनोखापन है 'बारह सिंगा (Swamp deer)'।

जी हाँ इस क्षेत्र में आज जितने बारह सिंगा छलांग लगाते देखे जा सकते हैं उतने विश्व में और कहीं जीवित भी नहीं बचे हैं। स्पष्ट है कि प्रकृति की अनूठी कृति बारह सिंगा की सबसे अधिक आबादी वाला क्षेत्र होने के कारण यह भारतवर्ष का ही नहीं बरन् विश्व का अद्वितीय क्षेत्र है और इसी क्षेत्र को 'दुदवा नेशनल पार्क' के रूप में एक सुगन्धित क्षेत्र घोषित करके उत्तर प्रदेश सरकार ने राष्ट्र के प्राकृतिक वैभव को अनन्तकाल तक चिर स्थायी बनाने का कदम उठाया है। ताकि आनेवाली पीढ़ियाँ देख सकें कि बारह सिंगों का ताज सर पर उठाये घूमते यह विशुद्ध भारतीय हिरण अपने प्राकृतिक रूप में कितने मनोहारी हैं।

बारह सिंगा ही नहीं और भी:—उपरोक्त जानकारी पाकर आपके मन में भी ललक उठी होगी कि चलो हम भी देखें उन बारह सिंगों वाले हिरणों की हजारों की टोलियाँ। आइये आपका स्वागत है। बारह सिंगों के साथ-साथ इस राष्ट्रीय उद्यान में हिरणों की चार अन्य जातियाँ भी बहुतायत से चौकड़ी भरती हुई देखने को मिलती हैं चीतल (स्पार्टेड डियर), पाडा (हाग डियर), साभर, काकड़ (बार्किंग डियर)।

इसके साथ ही नील गाय एवं कालाहिरण (ब्लैक बक) भी इस क्षेत्र में उन्मुक्त विचरते हुए देखे जा सकते हैं।

इन घास चरने वाले वन्य पशुओं के भुण्ड पर छलाँग लगाकर अपनी दहाड़ से जंगल का कलेजा कंपा देने वाले 'टाइगर' (बाघ) को सड़क पार करते हुए अथवा पार्क में बहती नदी, नाले अथवा विशालकाय तालाबों में डुबकी लगा कर गर्मी को दूर भगाते हुए देखने के अवसर इस पार्क में बहुतायत से मिलते हैं। जाज दुदवा नेशनल पार्क में पाये जाने वाले बाघों की संख्या चालीस से पचास के लगभग है। भारत के इस राष्ट्रीय पशु को उत्तर प्रदेश में प्राकृतिक रूप से शेष बची यह सबसे बड़ी संख्या है।

बाघ के साथ ही तेंदुये भी इस पार्क में उपलब्ध हैं। इनके अतिरिक्त लगभग पच्चीस हाथी एवं सत्तर भालू भी इन वनों में स्वच्छंद रूप से विचरते हुये देखे गये हैं।

इस पार्क में लगभग चार सौ विभिन्न प्रकार की रंग बिरंगी चिड़ियां निवास करती हैं। जिनमें मोरों एवं जंगली मुर्गों की टोलियां तो प्रत्येक पगडंडी पर दिखाई पड़ती हैं।

वनों की गोद में पलती हुई थारू सभ्यता: दुदवा नेशनल पार्क में उपरोक्त प्राकृतिक वैभव के साथ-साथ उसकी सीमा पर स्थित घने वनों के बीच फलती फूलती थारू जन जाति और उसकी सभ्यता इसे सांस्कृतिक दृष्टि से भी एक अद्वितीय नेशनल पार्क होने का गौरव प्रदान करती है। सतरंगी चोली घाघरे में लिपटी थारू महिलाओं के पुष्ट हाथों से पुतकर संगमरमर जैसे चमकते रहने वाले उनके मिट्टी के घरों की देखकर वातानुकूलित होटलों में ठहरने वाले पर्यटक भी ललचा उठते हैं। इनके परम्परागत सामूहिक नृत्य देखने हेतु तो पर्यटकों की टोली सदैव आग्रह करती है।

थारू जन जाति की महिलायें स्वयं को राजपूताने से संबंधित बताती हैं और सदियों पूर्व उस समय इन घने वनों में आकर शरण ली थीं जब मुगलों के साथ युद्ध करते हुए पुरुष वर्ग मारा गया था और महिलायें अपने स्त्रीत्व की मर्यादा हेतु सेवकों को साथ लेकर राजपूताने से चल दी थीं। इस लम्बे काल में इन्होंने अपनी सहज बुद्धि से वन्य जीवन के पर्यावरण की पेचीदगियों को बूझते हुए एक ऐसी जीवन पद्धति की खोज कर ली है जिसमें उन्हें मशीनी दुनिया पर किसी प्रकार निर्भर नहीं रहना पड़ता है। इनके सांस्कृतिक जीवन और वन्य जीवन के पारस्परिक तालमेल को देखते हुए इन्हें स्थायी रूप से इसी स्थल पर बसने हेतु दिसम्बर १९७६ में अंतिम रूप से सर्वेक्षण करके लगभग तेरह हजार एकड़ वन भूमि पर स्थायी अधिकार प्रदान कर दिया गया है जिसमें वह कृषि कार्य करते रहेंगे। इसके साथ ही इन्हें बाहरी कुप्रभावों से बचाने हेतु पार्क सीमा पर स्थित उन घने वनों को भी पार्क प्रशासन के अन्तर्गत रखा गया है जिनके बीच अनुमानतः सोलह हजार आबादी वाली यह जनजाति बसी हुई है। इन वनों में इन्हें अपने पशुओं को चराने की निःशुल्क सुविधा दी जा रही है। जलाने हेतु सूखी लकड़ी व छप्पर बनाने हेतु घास फूस भी अत्यन्त रियायती दर पर पार्क क्षेत्र से निकालने की सुविधा है। इसी क्षेत्र में स्थित एक वन विश्राम भवन 'चंदनचौकी' को निःशुल्क रूप से स्टेट बैंक को सुलभ करके अपनी शाखा खोलने हेतु प्रोत्साहित किया गया।

थारू जन जाति के इतिहास में सर्वप्रथम उन्हें पार्क प्रशासन द्वारा वन सहकारी समिति के रूप में संगठित करके फरवरी १९७७ में ठेकेदारों की प्रतियोगिता से बचाते हुए उन्हें लकड़ी काटने तथा उसकी उपज को बेचकर

लाभ कमाने हेतु ठेका दिया गया। इस प्रकार जहाँ इस नेशनल पार्क की स्थापना से इस क्षेत्र के अद्भुत वन्य जन्तुओं को स्थाई घर मिलेगा वहीं इस जन जाति को अपनी पारम्परिक संस्कृति को सुरक्षित रखते हुए प्रगति करने का अवसर भी।

संरक्षण के साथ-साथ पर्यटन भी—पर्यटन आज विश्व में चोटी के उद्योगों में गिना जाता है। लोग वर्ष भर अपनी कमाई से बचा कर संजोते रहते हैं ताकि अवकाश के दिनों में ऐसे ही किसी क्षेत्र में जाकर प्रकृति के रूप का पान कर सके, वन्य जन्तुओं के बीच कुछ दिन बिताकर चिन्तामुक्त जीवन का आनन्द उठा सकें। इस दृष्टि से दुदवा नेशनल पार्क की सम्भावनाएँ असोम हैं क्योंकि प्राकृतिक सौन्दर्य के जिस अनूठेपन को सुरक्षित रखने हेतु इसे नेशनल पार्क घोषित किया गया वह पर्यटन उद्योग के लिए भी अनूठा कच्चा माल है। यहाँ अभी से देश विदेश के पर्यटन आने लगे हैं और प्रत्येक आने वाला इसके प्राकृतिक वैभव को देखकर यही कहता है कि 'अद्भुत'। हमने सोचा भी नहीं था कि घरती पर इतने मनोहारी दृश्य उपलब्ध हैं। इन कौतूहल पूर्ण पशु पक्षियों का सामोप्य इतना रोमांचकारी हो सकता है।

पर्यटन उद्योग ही नहीं वैज्ञानिक शोध भी—वनस्थिति एवं वन्य जन्तुओं के जिस अद्भुत प्रतिनिधित्व के कारण यह क्षेत्र नेशनल पार्क की श्रेणी में लाने के उपयुक्त पाया गया, वह पर्यटकों के मनोरंजन ही नहीं परिस्थिति-विज्ञान (Ecology) की दिशा में शोध हेतु भी अद्वितीय है। संक्षेप में कहा जाये तो 'नेशनल पार्क' प्रकृति की गोद में स्थापित ऐसी प्रयोगशालाएँ होती हैं जहाँ जाकर इकालाजिस्ट अध्ययन करते हैं कि विभिन्न प्रकार के पशु-पक्षियों के अस्तित्व के लिए अनिवार्य परिस्थितियाँ कौन सी हैं और उन पर मनुष्य के क्रिया कलापों का क्या प्रभाव पड़ता है। इस दृष्टि से देखने पर दुदवा नेशनल पार्क का वैज्ञानिक महत्त्व अत्यन्त दूरगामी है। क्योंकि यह पहले ही लिखा जा चुका है कि बारहमिंगों वाले दलदली क्षेत्र के हिरणों की सबसे अधिक संख्या यदि घरती पर कहीं जीवित है तो इसी क्षेत्र में। इसलिए यदि इसके प्राकृत परिवेश (हैबीटैट) एवं इसकी परिस्थिति जन्य आवश्यकताओं पर शोध संभव है तो इसी क्षेत्र में। उल्लेखनीय है कि इस दृष्टि से दुदवा नेशनल पार्क की सम्भावनाओं का आकलन करने आक्सफोर्ड विश्वविद्यालय के ख्याति प्राप्त इकालाजिस्ट डा० माल्कमकोय ने २३ से २५ जनवरी १९७७ तक इस क्षेत्र का अध्ययन मेरे साथ साथ किया एवं यही मत व्यक्त किया कि इकालाजी को शोध हेतु तो यह क्षेत्र अमूल्य खजाना है।

कुछ समस्याएँ भी हैं—दुदवा नेशनल पार्क की स्थापना एवं इससे उपलब्ध हो सकने वाले उपरोक्त लाभों की राह में कुछ समस्याएँ भी हैं। सर्वाधिक महत्वपूर्ण समस्या है नेशनल पार्क की उपयोगिता के प्रति जन-अनभिज्ञता। यहाँ तक कि समाज के प्रबुद्ध वर्ग द्वारा भी प्रश्न उठाया जा रहा है कि पूरे पाँच सौ वर्ग किलोमीटर वाले वन क्षेत्र को नेशनल पार्क के रूप में सुरक्षित क्षेत्र घोषित करना कहाँ की बुद्धिमानी है जबकि इस क्षेत्र में पेड़ों का कटान करने से राज्य सरकार को करोड़ों रुपयों की आय हो रही थी? इसी प्रकार इस क्षेत्र के नेशनल पार्क बन जाने के कारण इसकी सीमा पर बसे ग्रामवासियों के जानवरों के चरान चुगान पर रोक लगने

के कारण उत्पन्न हुई समस्या है ? इन प्रश्नों एवं समस्याओं का कोई दो-दूक उत्तर अथवा सामाधान नहीं है । क्योंकि जब तक जन साधारण, विशेषकर स... जागरूक वर्ग यह सोचना प्रारम्भ नहीं करता कि वन्य जीव जन्तुओं एवं उनको सुरक्षा प्रदान करने वाली वनस्पति किसी भी राष्ट्र की सांस्कृतिक धरोहर होती है तब तक मात्र कानून बना देने से इनकी सुरक्षा सम्भव नहीं होगी । जहाँ तक वन्य पशुओं की तुलना में पालतू पशुओं के चरान पर रोक लगने का प्रश्न है तो इसका हल नेशनल पार्क के बाहर के क्षेत्रों में अधिक चारा उत्पादित करके ही किया जा सकता है । क्योंकि सम्पूर्ण देश अथवा प्रान्त के क्षेत्रफल की तुलना में अत्यन्त नगण्य ग्रंथ ही वन्य पशुओं हेतु सुरक्षित रखा गया है । उदाहरणार्थ लगभग तीन लाख वर्ग किलोमीटर क्षेत्रफल वाले उत्तर प्रदेश में दो ही नेशनल पार्क हैं—काबेट एवं दुदवा । और इनका सामूहिक क्षेत्रफल लगभग एक हजार वर्ग किलोमीटर ही है । फिर भी यदि तत्काल उपलब्ध हो सकने वाले आर्थिक लाभ के लालच में हमने ऐसे अद्वितीय क्षेत्रों के प्राकृतिक सौन्दर्य को नष्ट हो जाने दिया तो आने वाली पीढ़ियाँ मात्र कहानियों के माध्यम से ही जान सकेंगी कि कभी लखीमपुर जनपद में एक ऐसा भी क्षेत्र था जिसमें प्रकृति ने बारासिगा नामक हिरण को इतनी बड़ी संख्या में जन्म दिया था जितने विश्व में और कहीं भी नहीं थे किन्तु उस समय की पीढ़ी इतनी स्वार्थी थी कि उसने उन्हें जीवित नहीं रहने दिया । क्या हमारी पीढ़ी यह अपराध अपने सर लेना चाहेगी ? यदि नहीं तो आइये इस अद्वितीय वन्य पशु और उसके 'प्राकृत परिवेश' को सुरक्षित रखने में सहयोग दें । साथ में जो भी लाभ होंगे वह कम महत्वपूर्ण नहीं है किन्तु सबसे अधिक महत्वपूर्ण है यह तथ्य कि पृथ्वी पर प्रकृति ने जितने भी जीव बनाये हैं उनमें से मनुष्य एक है और इनमें से प्रत्येक जीव का दूसरे के अस्तित्व के लिए सीधे अथवा अनदेखे ढंग से महत्व है । इसके साथ ही पृथ्वी पर जन्मे जीव जन्तुओं में सर्वश्रेष्ठ होने के कारण मानव जाति का यह नैतिक दायित्व भी है कि वह स्वयं से कम बुद्धिमान एवं शक्तिशाली पशुओं को भी जीने का अधिकार प्रदान करे । यह अधिकार हम दुदवा नेशनल पार्क जैसे इने गिने राष्ट्रीय उद्यानों को अखण्ड सुरक्षा प्रदान करके ही दे सकते हैं, क्योंकि एकमात्र यही वह क्षेत्र है जहाँ अभी तक मशीनी दुनिया का प्रभुत्व स्थापित नहीं हो पाया है । अन्यथा तो महासागरों की तलहटी से अंतरिक्ष के सुदूर कोनों तक मशीनों का शोर छा चुका है और उसमें अन्य जीव जन्तुओं का तो क्या स्वयं मनुष्य का दम घुटने लगा है । इसलिए आइये अभी तक अजेय बच रहे धरती के टुकड़ों के प्राकृतिक सौन्दर्य को रक्षा अपनी पूरी क्षमता से करें ताकि आने वाली पीढ़ियाँ भी मशीनी दुनिया के दम घोट वातावरण से थक जाने पर कुछ पल को अपनी आदि-जननी प्रकृति की गोद में सुस्ताने आ सकें और वहाँ धरती की कोख में अपनी जड़ों की मजबूत पकड़ के सहारे ऊँचे उठकर आसमान छू लेने की होड़ लगाते हुए कटावर वृक्षों की घनी छाया में स्वच्छन्द विचरते शेर, तेंदुआ, हाथी, बारासिगा, नील गाय, काला हिरन आदि के रोमांचकारी सम्पर्क का अनुभव करते हुए तरोजा हो सकें ।

(See R.N. Misra's book 'The Wildlife of India')

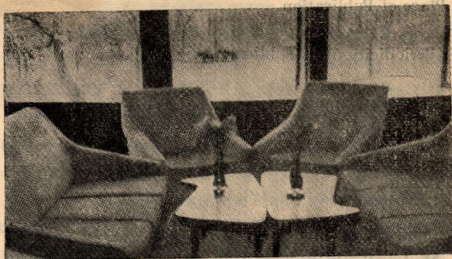
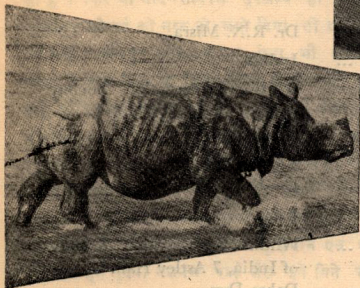
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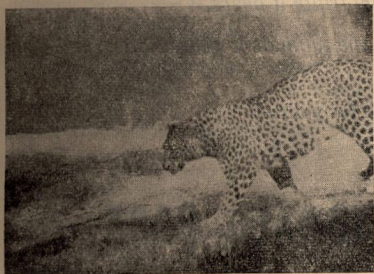
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